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Study Circles Applied to Shipyards**

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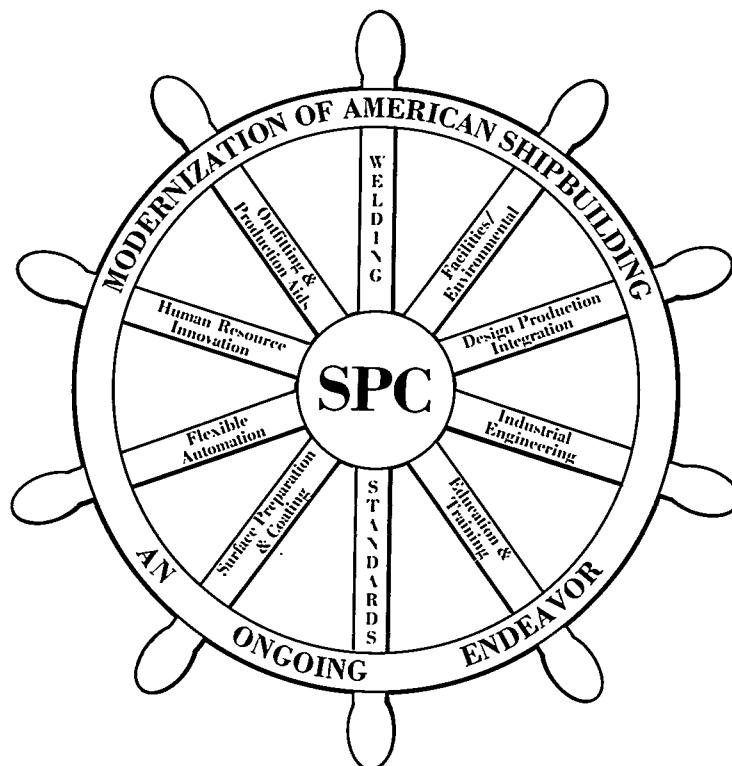
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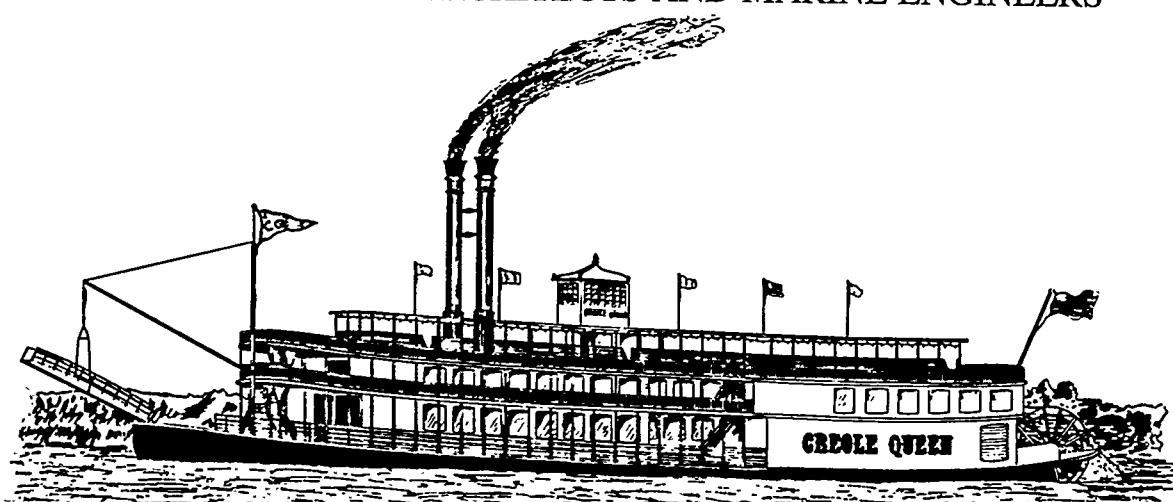
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Study Circles Applied to Shipyards

No. 30

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ABSTRACT

STUDY CIRCLES ARE A SCANDINAVIAN CONCEPT, IT IS ESTIMATED IN THESE COUNTRIES, EVERY INDIVIDUAL JOINS A STUDY CIRCLE EVERY YEAR, STUDY CIRCLES ARE VOLUNTARY, SELF-FACILITATING GROUPS INTERESTED IN A PARTICULAR SUBJECT, THE RANGE OF THESE SUBJECTS MAY BE FROM LEARNING BASIC PHOTOGRAPHY TO REFERENDUM ISSUES ON NUCLEAR POWER, BACKGROUND MATERIAL IN THE AREA OF THE SUBJECT OF THE STUDY CIRCLE IS PROVIDED BY THE GOVERNMENT, THIS PAPER WILL EXAMINE A METHOD OF TRANSPLANTING THE STUDY CIRCLE CONCEPT TO A LARGE, HEAVY-INDUSTRY, FACILITY OF THE FEDERAL GOVERNMENT - A SHIPYARD-TO SOLVE PROBLEMS BEYOND THE SCOPE OF TRADITIONAL QUALITY CIRCLES.

STUDY CIRCLES

The program of a Scandinavian concept transplanted in a large, heavy-industry, facility of the Federal government solving problems beyond the scope of traditional quality circles. This paper will compare the study circle concept with two common forms of problem-solving groups - the task force and the quality circle. In making the comparison, the three groups - the task force, the quality circle, and the study circle - will be examined using the following six attributes: participant selection, participant involvement, training, participant representation, skill level, and goal selection. The task force and the quality circle are developed in parallel below to aid in discerning similarities and differences.

TASK FORCE

The traditional management approach to problem-solving is the task force. One definition of the task force is a temporary grouping of selected individuals under one leader for purpose of accomplishing a definite objective. A typical shipyard application of a task force would be to summon a group of individuals to solve a problem. In summoning the group, management would identify individuals with specific education, experience or skills, and assign these individuals to work as a group solving a pre-determined problem. In this application the problem might be leaking hull valves after reinstallation during an overhaul. After the problem solution was presented to management, the task force would disband with these individuals returning to their parent departments.

The task force will be examined employing the following six attributes: participant selection, participant involvement, training,

QUALITY CIRCLE

Quality circle is a generic term used to identify a participatory management approach to problem-solving. One definition of the quality circle is a small group of employees and their supervisor, with same work area interests, who voluntarily form a team, receive training in group problem-solving techniques, regularly meet to identify work-related problems, recommend solutions to their management for approval, and monitor effectiveness of these solutions. This definition of quality circles is espoused by the International Association of Quality Circles. Unions generally perceive quality circles ranging from just another management tool (in favorable light) to Union-busting (at the other extreme). Management generally perceive quality circles ranging from another management tool (in favorable light) to contemptible (at the other extreme). A typical shipyard application of a quality circle would be a supervisor leading a group of

participant representation, skill level, and goal selection.

Participant Selection - individuals are usually assigned to the task force due to being subject-matter experts (example - the "cracker-jack" mechanical engineer from fluid systems).

Participant Involvement - usually involuntary, individuals are assigned to the task force as representatives of higher authority (example - as cognizant functional areas are identified, someone is delegated from the functional area - the engineer from fluids).

Training - since the individual was assigned due to being a demonstrated subject-matter expert, the individual is usually presumed to be trained in sufficient group problem-solving techniques (example - intuitively obvious; otherwise, the individual would not be a "cracker-jack" engineer).

Participant Representation - in generating the task force, determinations are made to assure representation covering all involved functional areas.

Skill Level - as participants are subject-matter experts from various functional areas, skill levels are advanced in subject/function.

Goal Selection - usually predetermined as definite objective of the task force.

In comparing the task force with the other two problem-solving groups - the quality circle and the study circle, the first three attributes: participant selection, participant involvement and training, may be perceived as limiting effectiveness of the task force. Management selecting an individual to be a member of the task force does not assure the selected individual believes there is a problem. Unless involvement of the selected individual is voluntary, there is no ownership in the group goal. Being the subject-matter expert does not assure training in group problem-solving techniques. The last three attributes: participant representation, skill and goal selection, may be perceived as enhancing effectiveness of the task force as a problem-solving tool.

employees under this supervisor to solve a problem in their immediate work area. In this application the problem of the quality circle might be new sewing machines for the sail loft.

The quality circle will be examined employing the following six attributes: participant selection, participant involvement, training, participant representation, skill level, and goal selection.

Participant Selection - in using the above definition, voluntary; the participant is usually expert at the immediate function,

Participant Involvement - by using the above definition, voluntary; also by using the above definition, the participant has same work area interests as rest of the group.

Training - by definition, the participants receive training in group problem-solving techniques.

Participant Representation - all involved functional areas may not be represented as group is voluntary, and have the same work area interests, (example - the group may need an industrial engineer to determine methods/standards for the new equipment).

Skill Level - as participants only are experts at their immediate functions as compared with subject-matter, skill levels vary in the group (example - supervisor, mechanic, helper, temporary, clerk, and so on).

Goal Selection - any random goal is appropriate grist for the group (example - relocation/type of consumables carried in vending machines, Pepsi v Coke).

In comparing the quality circle with the other two problem-solving groups, the task force and the study circle, the first three attributes: participant selection, participant involvement, and training, may be perceived as enhancing effectiveness of the group. The last three attributes: participant representation, skill level, and goal selection may be perceived as limiting effectiveness of the group. Lack of representation transforms the work group into the "haves" and the "have-nots." The skill level of the group is diverse as the spectrum, for most members are not subject-matter experts. The goal of the group may not parse with organizational goals, and may even oppose organizational goals.

STUDY CIRCLE

Is it possible to meld traditional management approach with participatory management approach to group-problem solving? Study circles offer a possible solution to those attributes limiting effectiveness of the task-force/quality-circle. One definition of the study circle is a systematic study of a common goal, with each member interacting and responsible for the circle, and with sufficient scope/flexibility to adjust activities.

The study circle will be examined employing the six attributes used to examine the task-force/quality-circle.

Participant Selection - subject-matter experts volunteer to serve on circle.

Participant Involvement - participants hold ownership as circle members share common goal.

Training - circle utilizes facilitator, and receives training in group problem-solving techniques.

Participant Representation - in generating circle, all involved functional areas are assured representation.

Skill Level - circle participants are subject-matter experts, and receive training.

Goal Selection - objective of circle is pre-determined.

The six attributes may be used to predict the outcome of this problem-solving group - the study circle. In conceiving the study circle, the attributes enhance the effectiveness of the group. There are two rules the circle needs to follow to be effective. The cardinal rule is the study circle is voluntary. The second rule is interest in the goal. Adherence or lack of adherence to these rules determines success or lack of success of the study circle.

APPLICATION

The definition, attributes, and rules develop a model of the study circle. The proof occurs in application of the model. Application of study circles as a problem-solving group occurs at Mare Island Naval Shipyard.

The concept of study circles was first broached at the Quality Circle Steering Committee meeting by the

Quality Assurance Officer. The author of this paper was a facilitator in the Quality Circle Office, and a member of the Steering Committee. The author was familiar with the concept of study circles from Union Literature. After subsequent brief discussion, the Quality Circle Office agreed to develop a study circle model, and to facilitate study circles as-available/as-needed. Tenor of this discussion was that the rate of circle increase was declining, and the Quality Circle Office needed to expand services.

The definition/attributes/rules are parameters of the study circle model. The definition and attributes of the study circle are presented in the comparison of the three problem-solving groups - the task force, the quality circle, and the study circle. The rules of the model are presented in Figure 1. The office also developed a hand-out, founded on the model, for parties interested in initiating a study circle. Figure 1 is the cover sheet for the hand-out. Attached to the cover sheet were copies of articles listed in the bibliography of this paper on study circles.

The following is an historical narrative of the first study circle.

After developing the model, the Quality Circle Office published an article in the shipyard newspaper, "grapevine." The article paraphrased information in the study circle hand-out cover sheet (Figure 1).

After several weeks the Quality Circle Office had received several requests for study circles. The initial response of the Quality Circle Office was to provide a synopsis of study circles to interested parties. The synopsis stressed - in the hand-out and by the facilitator - though the goal may be pre-determined, the participants must be volunteers. If a party still expressed an interest; then, the Quality Circle Office advanced enough copies of the hand-out for potential participants. It remained for the interest party - the party interested in initiating a study circle - to select goal and participant representation. After preliminaries (goal selection, participant representation/involvement/selection) were discharged by the interested party, an initial meeting was scheduled by the Quality Circle Office for the study circle.

STUDY CIRCLES

STUDY CIRCLES HAVE LONG BEEN POPULAR IN SCANDINAVIA. THE QUALITY CIRCLE OFFICE WILL PROVIDE FACILITATION FOR STUDY CIRCLES. THE STUDY CIRCLE WILL OPERATE WITHIN THE FOLLOWING PARAMETERS:

- I. MEMBERSHIP WILL BE BETWEEN 5 AND 15 MEMBERS,
- II. EACH AREA REPRESENTED IN THE STUDY CIRCLE WILL HAVE A MINIMUM OF ONE MEMBER AT EACH STUDY CIRCLE MEETING.
- III. EACH MEMBER SHOULD HAVE INTEREST IN THE PROJECT BEING EXAMINED BY THE STUDY CIRCLE.
- IV. THE STUDY CIRCLE WILL MEET DURING NORMAL WORK HOURS.
- V. THE STUDY CIRCLE WILL MEET FOR MINIMUM OF ONE-HOUR PER WEEK.
- VI. MINIMUM TRAINING FOR ALL STUDY CIRCLE MEMBERS ARE QUALITY CIRCLE LESSON 3 (BRAIN STORMING), AND LESSON 4 (CAUSE/EFFECT ANALYSIS).
- VII. THE STUDY CIRCLE LEADER WILL BE SELECTED FROM STUDY CIRCLE MEMBERS,
- VIII. THE STUDY CIRCLE LEADERSHIP WILL BE ROTATED,
- IX. THE STUDY CIRCLE WILL MAKE A MINIMUM OF A FINAL, FORMAL MANAGEMENT PRESENTATION .

THE QUALITY CIRCLE OFFICE WILL PROVIDE THESE SERVICES, AS A MINIMUM TO THE STUDY CIRCLE:

1. PROVIDE MINIMUM OF ONE-HOUR PER WEEK OF STUDY CIRCLE MEETING FACILITATION.
2. PROVIDE QUALITY CIRCLE LESSONS TRAINING TO THE STUDY CIRCLE.
3. MAINTAIN SUMMARY OF STUDY CIRCLE MEETINGS.

MEETINGS

Figure 2 is "Summary of Meeting Activities," used as minutes for each study circle meeting.

The first study circle - "Hull Patch," accomplished the study in 16 weeks. The study circle had 12 meetings, taking 88 meeting-hours. A digest of the minutes for each meeting is presented in the following format: meeting leader, circle stage, leader comments, focus, facilitator notes.

Meeting I - Facilitator led meeting.

Facilitator Notes: Everyone is committed/roaring-to-go, study circle needs to learn problem-solving techniques; group determined extent of study circle and regular members; initial consideration for study circle came from departments of non-destructive test, shippers, and riggers; attending members requested participation from two additional departments - naval architects and welders; non-destructive test members will get support from naval architects and welders to join circle; assured all made commitment to be active participants, assured all aware of minimum support from circle office as outlined in hand-out.

Meeting II - Facilitator led meeting.

Stage: Group went through brainstorming training, and a ranking of ideas techniques; new members from naval architects and welders were introduced.

Facilitator Notes: Good participation in brainstorming exercise and responses to questions; provided members w/book "How to Make Meetings Work."

Meeting III - Facilitator led meeting.

Stage: Group went through cause/effect analysis training exercise, and a different ranking of ideas technique was given to the circle.

Facilitator Notes: Group is coalescing into dedicated force group realizing definition of goal is fuzzy, expect better goal resolution at upcoming meeting.

Meeting IV - Member led meeting.

Stage: Problem/cause identification.

Comments: Good participation of members, meeting did not stop on-time, there are some problems in control, groups needs to remember brainstorming rules.

Focus: Missing member report was given; review goal - "Hull Patch I," determined effect - "Hull

Patch 1 not on-time," determined most significant cause - "Lack of communication."

Facilitator Notes: Group determined effect and most significant cause through brainstorming and ranking techniques, good application of previous lesson learned.

(Author's Note: As stated in Figure 1, leadership of the circle would rotate among circle members. After the circle completed training in meeting III, leadership of the circle was given to members. Rotating leadership commenced with this meeting.)

Meeting V - Member led meeting.

Stage: Problem/cause identification, and presentation preparation. Comments: Meeting did not stop on-time.

Focus: Group continued Hull Patch review, group has decided to simultaneously review all Hull Patches; group has also decided to change effect from "Hull Patch 1" to "Lack of communication;" group determined best possible solution - "Hull Patch overall coordinator."

Facilitator Notes: Group is taking bull-by-horns, group is making good progress.

Meeting VI - Facilitator led meeting.

Stage: Solution identification.

Comments: Groups needs to keep comments germane to purpose of study circle.

Focus: Group brainstorming coordinator duties, ranking most significant duties.

Facilitator Notes: There was much discussion by non-destructive test members why shippers should be coordinator, and by shipper members why non-destructive test should be coordinator; group needs to realize function of group is to provide mutual assistance, all in group need help whenever becomes coordinator based-on duties as proposed by group.

Meeting VII - Member led meeting.

Stage: Solution identification.

Comments: Meeting did not start on-time.

Focus: Group continuing brainstorming coordinator duties, ranking most significant duties; group given training in force-field analysis; force-field analysis first performed on shippers as coordinator.

Facilitator Notes: Group made good use of Ishikawa diagram to determine need for management presentation; group needs to perform force-field analysis on other group members to determine coordinator.

STUDY CIRCLE

SUMMARY OF MEETING ACTIVITIES

(THIS FORM TO BE COMPLETED BY STUDY CIRCLE LEADER AFTER EACH MEETING.)

STUDY CIRCLE NAME _____

LEADER _____ FACILITATOR _____

DATE _____ TIME FROM _____ TO _____

LIST NAMES OF MEMBERS AT MEETING

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

WHAT STAGE OF THE STUDY CIRCLE PROCESS IS YOUR CIRCLE IN?

TRAINING (LESSON)

PROBLEM IDENTIFICATION — SOLUTION IDENTIFICATION

CAUSE IDENTIFICATION — PRESENTATION PREPARATION

DATA GATHERING — OTHER _____

MEETING EVALUATION (TO BE COMPLETED BY LEADER)

_____ STARTED ON-TIME _____ AGENDA SET FOR NEXT MEETING

_____ AGENDA POSTED _____ STOPPED ON-TIME

_____ AGENDA FOLLOWED

_____ PARTICIPATION OF MEMBERS

COMMENTS (LEADER)

_____	_____
_____	_____

FOCUS WHAT HAPPENED DURING THE MEETING)

AGENDA FOR NEXT MEETING

~

FACILITATOR NOTES

FIGURE 2

Meeting VIII - Member led meeting.
Stage: Solution identification.
Focus: Group continuing force-field analysis; force-field analysis performed on non-destructive test to be coordinator; group brainstorming \$aving\$ with coordinator.

Facilitator Notes: Group needs to gather time-savings of having coordinator - avoid rework (numbers of time and numbers of people involved in patch ready, not able to install due rust on previously cleaned area or paint on previously cleaned area and so on).

Meeting IX - Facilitator led meeting.
Stage: Presentation preparation.

Comment: Meeting did not start on-time.
Focus: Group preparing for management presentation; assignments have been made for all represented departments to have role in presentation; for presentation groups needs to generate - time-savings, coordinator costs, total \$aving\$; group developing presentation agenda.

Facilitator Notes: Group needs to have all areas represented in presentation.

Meeting X - Facilitator led meeting.

Stage: Presentation preparation.
Comments: Meeting did not start on-time, group did not set agenda for next meeting.
Focus: Group delayed presentation for week, while group smoothes presentation; non-destructive test member gave missing member report; group established who to invite; non-destructive test members and shipfitter members preparing force-field analysis charts.

Meeting XI - Facilitator led meeting.

Stage: Presentation preparation.
Comments: Group did not post agenda.
Focus: Group has scheduled management presentation next week, continuing presentation practice.
Facilitator Notes: Facilitator will invite Quality Circle Steering Committee, will assure all designated persons are invited.

Meeting XII - Presentation.

EVALUATION

In the presentation the shipfitters volunteered to provide a supervisor to be coordinator for Hull Patch. The first study circle - "Hull Patch," accomplished the study in 16 weeks. The study circle had 12 meetings, taking 88 meeting-hours. The circle met again, 6 months later, to

review their solution and savings. At the meeting the review revealed a separate supervisor was not required as coordinator. The shipfitter supervisor on Hull Patch performed the coordinator role as collateral duty. The review also revealed rework, due to lack of coordination between the parties, was eliminated by the coordinator. Examples of eliminated rework experienced by the review are: area closed-out, area not properly prepared, area not laid-out, area not lighted, area painted-over, area rusted, and inclement weather. The review further revealed members of the circle had established an informal group to provide mutual assistance. The savings for the initial boat were documented by the study circle review to be in excess of \$24k.

EXPANSION

When success of the first study circle was published in the "grapevine," the shipyard newspaper, the Quality Circle Office received several requests for circles. After the Quality Circle Office provided a synopsis, only two interested parties were able to discharge preliminary (goal selection, participant representation/involvement/selection) to initiate a study circle. "Lost Instruments," was the commission of the second study circle. The commission of the third study circle was "Recycling Components."

The second study circle - "Lost Instruments," failed in 18 weeks. The circle had 15 meetings, taking 86 meeting-hours. The third study circle - "Recycling Components," accomplished the study in 23 weeks. The circle had 14 meetings, taking 130 meeting-hours. In reviewing these two circles, the necessity of satisfying the cardinal rule (participation is voluntary) becomes evident to all.

The following is a chronology of the second study circle - "Lost Instruments," applying an abbreviation of the format used for the first circle (based on Figure 2).

Meeting I - Facilitator led meeting.

Stage: Organizational.
Comments: Not all in group are committed.
Focus: Group determined extent of study circle - "Lost Instruments," determined regular members - mettology, productivity, tool, outside machine, electrical, calibration, pipe, electronics.
Facilitator Notes: Group is not sure there is a problem, mettology/

productivity members directed by off-site yard sources to reduce lost instruments (one lost instrument is too many); several participants directed to attend.

Meeting II - Stage - Training.
Focus - Group went through brain-storming training, and a ranking of ideas technique.

Meeting III - Canceled (lack of attendance).

Meeting IV - Stage - Training.
Focus - Group went through cause/effect analysis training exercise, and a different ranking of ideas technique was given to the group.
(Author's Note: As stated in Figure 1, leadership of the circle would rotate among circle members. After the circle completed training in meeting III, leadership of the circle was given to members. Rotating leadership commenced with this meeting.)

Meeting V - Stage - Problem identification.
Focus - Using cause/effect analysis group determined goal - "Lost Instruments."

Meeting VI - Stage - Problem/cause identification.
Focus - Group brainstorming causes.

Meeting VII - Stage - Solution identification.
Focus - Group given training in pareto analysis, and using technique to analyze lost instrument reports.

Meeting VIII - Canceled (leader no-show).

Meeting IX - Stage - Solution identification.
Focus - Group brainstorming solutions.

Meeting X - Stage - Solution identification.
Focus - Group ranking solutions.
Facilitator Notes - Pipe has dropped circle, pipe members believe have no problems with lost instruments.

Meeting XI - Stage - Solution identification.
Focus - Group ranking solutions.

Meeting XII - Stage - Solution identification.
Focus - Group continuing ranking solutions.

Meeting XIII - Stage - Problem identification.

Focus - Group given training in force-field analysis, using technique to determine root-problem.

Meeting XIV - Cancelled (lack of attendance).

Meeting XV - Stage - Organizational.
Focus - Group decided to meet again in 90 days, determine results of trial implementation of partial solution to problem.
Facilitator Notes - This is end of the circle.

The following is a chronology of the third study circle "Recycling Components," applying an abbreviation of the format used for the first circle (based on Figure 2).

Meeting I - Facilitator led meeting.
Stage: Organizational.
Comments: Everyone in circle is committed, group needs to learn problem-solving techniques.
Focus: Group determined extent of circle - "Recycling Components."
Facilitator Notes: Facilitator assured all in group made commitment to be active participants; group seems shaky about abilities as a group; turn-out for circle large, need more manuals for next meeting.

Meeting II - Stage - Training.
Focus - Group went through brain-storming training, and a ranking of ideas technique.

Meeting III - Stage - Training.
Focus - Group went through cause/effect analysis training exercise, and a different ranking of ideas technique was given to the circle.

Meeting IV - Stage - Problem identification.
Focus - Group brainstorming effect - "Recycling Components."
(Author's Note: As stated in Figure 1, leadership of the circle would rotate among circle members. After the circle completed training in meeting III, leadership of the circle was given to members. Rotating leadership commenced with this meeting.)

Meeting V - Stage - Cause identification.
Focus - Group brainstorming causes.

Meeting VI - Stage - Problem identification.
Focus - Group ranking causes.

Meeting VII - Stage - Solution identification.
Focus - Group brainstorming solutions.

Meeting VIII - Stage - Solution identification.
Focus - Group ranking solutions.

Meeting IX - Stage - Solution identification.
Focus - Group continuing ranking solutions.

Meeting X - Stage - Data-gathering/solution-identification.
Focus - Group tracking-data/generating-info.

Meeting XI - Stage - Presentation preparation.
Focus - Group generating saving data.

Meeting XII - Stage - Presentation preparation.
Focus - Group practicing presentation.

Meeting XIII - Stage - Presentation preparation.
Focus - Group continuing presentation practice.

Meeting XIV - Presentation.

RE-EVALUATION

In reviewing these two circles, the necessity of satisfying the cardinal rule (participation is voluntary) becomes evident to all. The second study circle - "Lost Instruments," failed in 18 weeks. The third study circle - "Recycling Components," accomplished the study in 23 weeks.

To be effective the study circle needs participation. Without voluntary participation there is no ownership of the goal nor implementation of solution by the circle members. Ownership of the goal needs to be established before commencing the circle. The second rule of the study circle is interest in the goal. To be effective the circle needs to be goal-directed. Interest in the goal will transcend most non-functional roles played by circle members enhancing the study circle process.

LESSONS LEARNED

Study circles do and will function in an industrial environment. Study circles follow the management design of an organization, and may be the better problem-solving group juxtaposed task forces and quality circles.

There are two rules the circle needs to follow to be effective. The cardinal rule is the study circle is voluntary. In retrospect the first

and third circles followed this rule at the first meeting. The digest of Meeting I for the first circle tells, "... everyone is committed/roarin' - to-go, ... assured all made commitment to be active participants, ... will get support from ..." The digest of Meeting I for the third circle tells, "everyone is committed, ... assured all made commitment to be active participants ..." The second circle failed this rule at the first meeting. The digest of Meeting I for the second circle tells, "not everyone is committed, ... group is not sure there is a problem, ... directed by off-shi pyard sources to reduce lost instruments (one lost instrument is too many), several participants directed to attend."

Another gauge indicating compliance with the cardinal rule is reason for circle meeting cancellation. Cancelling a scheduled meeting is distinct from agreeing not to meet for a specific period of time, with a meeting scheduled at end of the period. The second circle cancelled: Meeting III - lack of attendance, Meeting VIII - leader no-show, and Meeting XIV - lack of attendance. Meeting XV was the terminal meeting of the circle.

The second rule the circle needs to follow is interest in the goal. In retrospect the first and third circles also followed this rule by accomplishing their studies. The second circle also failed this rule. In Meeting X pipe dropped the circle, believing having no problems with lost instruments. Dropping the circle indicates lack of interest in the goal. Failing to accomplish the study also indicates lack of interest in the goal.

Study circles are alive and well at the shi pyard. The study circle concept is being expanded to reach into problem areas previously considered too institutionalized to be solved by any group. The experiences of quality circles are easily transferred to meet the needs of study circles. The addition of study circles to problem-solving groups by participatory management will enhance the effectiveness of the organization.

BIBLIOGRAPHY

1. Karen O Osborne, Renee S Schevat, "Study Circles: Personal / Professional Fulfillment for Employees," Management Review, Jun 82

2. Karen Q Osborne, "Informal Adult Learning/Public Policy Issues: The Study Circle Approach," New Directions for Continuing Education, Sep 81
3. Norman D Kurland, "The Scandinavian Study Circle: An Idea for the United States," The College Review Board, Winter 79-80
4. "study circle Consortium of New York, Facilitator Training Program," State Education Building, R234M, Albany

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